

## CLAIMS

1. A memory cell comprising:  
a memory medium for holding information,  
5 a controlling part for recording information in the memory medium, and  
a detecting element for reading information from the memory medium,  
wherein  
the detecting element is provided independently of the memory medium.
- 10 2. The memory cell according to claim 1, wherein  
the memory medium is a magnetic device;  
the controlling part comprises a first magnetic field generating part for  
applying a magnetic field to the magnetic device so as to change a magnetization  
state of the magnetic device; and  
15 the detecting element is arranged in the vicinity of the magnetic device and  
comprises a magnetoelectric converting part whose electric characteristics vary in  
accordance with the magnetization state of the magnetic device.
3. The memory cell according to claim 2, wherein  
20 the magnetoelectric converting part comprises a magnetoelectric converting  
element whose electric characteristics vary in accordance with a state of a magnetic  
field to be detected; and  
the magnetoelectric converting element is arranged in the vicinity of the  
magnetic device so as to detect a magnetic flux generated from the magnetic device.  
25
4. The memory cell according to claim 3, wherein the magnetoelectric  
converting element is an element whose electric resistance varies in accordance with  
the state of the magnetic field to be detected.
- 30 5. The memory cell according to claim 3, wherein the magnetoelectric



converting element is a semiconductor element.

6. The memory cell according to claim 5, wherein the semiconductor element is a transistor.

5

7. The memory cell according to claim 2, wherein a magnetization direction of the magnetic device has an angle with respect to a face of the magnetic device facing the magnetoelectric converting part.

10 8. The memory cell according to claim 2, wherein the magnetic device has a magnetic flux component in a direction perpendicular to its face facing the magnetoelectric converting part.

9. The memory cell according to claim 2, wherein the magnetic device  
15 comprises at least one magnetic material selected from the group consisting of a ferrimagnetic material, a magnetic material based on rare earth-transition metal, ferrite, and a ferromagnetic material composed of an oxide containing a transition metal.

20 10. The memory cell according to claim 2, wherein the magnetic device is composed of a magnetic material of a multicomponent system containing a plurality of components different from each other in the coercive force.

11. The memory cell according to claim 2, wherein a temperature at which the  
25 saturation magnetization value of the magnetic device is maximized is in a range of 80°C to 300°C.

12. The memory cell according to claim 2, wherein the magnetic device has Curie temperature of not lower than 100°C.

30



13. The memory cell according to claim 2, wherein the coercive force of the magnetic device has a tendency to decrease with a temperature rise within a predetermined temperature range.
- 5 14. The memory cell according to claim 2, wherein the first magnetic field generating part comprises a wiring that induces a magnetic field.
15. The memory cell according to claim 14, wherein the wiring is coiled.
- 10 16. The memory cell according to claim 2, further comprising a second magnetic field generating part to apply an offset magnetic field to the magnetoelectric converting part.
- 15 17. The memory cell according to claim 2, further comprising a stem composed of a soft magnetic device, the stem being arranged opposite to a side of the magnetoelectric converting part facing the magnetic device.
- 20 18. The memory cell according to claim 2, further comprising a shield composed of a soft magnetic device, the shield being arranged so that the magnetic device is interposed between the shield and the magnetoelectric converting part.
19. The memory cell according to claim 2, comprising a plurality of the magnetic devices.
- 25 20. The memory cell according to claim 19, wherein  
the magnetoelectric converting part comprises a magnetoelectric converting element that varies its electric characteristics in accordance with the state of the magnetic field to be detected, and  
the magnetoelectric converting element is arranged in the vicinity of the  
30 magnetic devices so as to detect magnetic fluxes generated from the magnetic



devices.

21. The memory cell according to claim 20, wherein  
the magnetoelectric converting element comprises a transistor, and  
5 the plural magnetic devices are arranged corresponding to one channel of  
the transistor.

22. The memory cell according to claim 21, wherein  
magnetic properties of the plural magnetic devices corresponding to the one  
10 channel vary in accordance with distances from the channel.

23. The memory cell according to claim 20, wherein  
the magnetoelectric converting element comprises a transistor,  
the transistor comprises a plurality of channels corresponding to the plural  
15 magnetic devices, and one gate electrode that is arranged above at least two of the  
channels and that corresponds to the at least two channels, and  
the transistor has electric characteristics that vary due to the electric  
characteristics of the channel changing in accordance with the state of the magnetic  
field to be detected.

20

24. The memory cell according to claim 23, wherein the transistor has one gate  
electrode arranged above the plural channels.

25. The memory cell according to claim 20, wherein  
25 the magnetoelectric converting element comprises a transistor,  
the transistor comprises a plurality of channels corresponding to the plural  
magnetic devices, and a plurality of gate electrodes arranged above the respective  
channels so as to correspond to the respective channels, and  
the transistor has electric characteristics that vary due to variation in  
30 electric characteristics of the channels in accordance with the state of the magnetic



field to be detected.

26. The memory cell according to claim 6, wherein the magnetoelectric converting element comprises a plurality of transistors.

5

27. The memory cell according to claim 26, wherein a drain electrode of one of an adjacent pair of transistors and a source electrode of the other transistor are equipotential.

10

28. A memory comprising:  
the memory cell according to claim 1,  
an information-recording conductive line for recording information in the memory cell, and  
an information-reading conductive line for reading the information.

15

29. A memory comprising:  
the memory cell according to claim 2,  
an information-recording conductive line for recording information in the memory cell, and  
an information-reading conductive line for reading the information.

20

30. The memory according to claim 29, comprising a plurality of the memory cells, the memory cells being arranged in a matrix.

25

31. The memory according to claim 30, wherein  
the magnetoelectric converting part in each of the memory cells arranged in a matrix comprises a transistor, and  
at least one electrode selected from the group consisting of the source electrodes and the drain electrodes in the transistors of the memory cells different  
from each other are equipotential.

30



32. A method for manufacturing the memory cell according to claim 3, the method comprising:

(i) forming, on a surface of a semiconductor, a magnetoelectric converting element that has electric characteristics varying in accordance with a state of a magnetic field to be detected,

(ii) forming a magnetic device so that the magnetoelectric converting element is interposed between the magnetic device and the semiconductor substrate, and

(iii) forming, in the vicinity of the magnetic device, a magnetic field generating part for changing the magnetization state of the magnetic device;

in the step (ii), the magnetic device is formed in the vicinity of the magnetoelectric converting element so that the magnetoelectric converting element detects a magnetic flux generated from the magnetic device.

33. The method for manufacturing a memory cell according to claim 32, wherein the magnetoelectric converting element is a transistor.

34. The method for manufacturing a memory cell according to claim 32, wherein a plurality of the magnetic devices are formed in the step (ii).

35. A method for recording/reading information in/from the memory according to claim 28, wherein

recording/reading of information is carried out by changing a current applied to at least one conductive line selected from the group consisting of an information-recording conductive line and an information-reading conductive line.

36. A method for recording/reading information in/from the memory according to claim 29, wherein

recording/reading of information is carried out by changing a current applied to at least one conductive line selected from the group consisting of an



information-recording conductive line and an information-reading conductive line.

37. The method according to claim 36, the method comprising:

changing a current applied to the information-recording conductive line so  
5 as to change the magnetic field generated at a first magnetic field generating part,  
thereby changing a magnetization state of the magnetic device by the changed  
magnetic field so as to record information in the memory, and  
changing a current applied to the information-reading conductive line,  
thereby detecting electric characteristics of the magnetoelectric converting part so as  
10 to read information recorded in the memory.